

ISO Register of Geodetic Codes and Parameters

Status and Future

Larry Hothem (Vice-Chair)
Control Body for the ISO RGCP

... building the foundation of the geospatial infrastructure, brick by brick ...



Acknowledgement

Mike Craymer, Geodetic Survey of Canada
is the
Chair, Control Body for the ISO Registry of
Geodetic Codes and Parameters



Background

- November 1994 - ISO TC211 established
- 1995-2005 - project teams organized to work on standards and technical specifications related to geodetic information and coordinate systems
- 2005-2007 – initial call to host the geodetic registry
- 2007 – TC211 Resolution of 2007-11-02



ISO TC211 Resolution 400 (2007-11-02)

Control body for the ISO geodetic registry network

1. Instructed the Chairman to establish the control body for the ISO geodetic registry network;
 - the Chairman shall approach IAG for their nomination of a chair.
 - the Secretariat shall send out a call for nominations to serve as a member of the control body.
2. ISO/TC 211 resolves that the control body shall
 - consist of geodetic experts nominated from P-members.
 - **control body may invite geodetic experts from liaison members to join the control body**
3. The **control body** shall draft a **terms of reference** in cooperation with the secretariat

Referenced Documents for the ISO Geodetic Registry

- **ISO TS 19127:2005 - Geodetic codes and parameters**
 - Defines rules for the population and maintenance of registers of geodetic codes and parameters
 - Revision pending – TC211 is seeking a project lead and experts
- **ISO IS 19111:2007 - Spatial referencing by coordinates**
 - Data model for reference systems
 - Registry information must conform to requirements of ISO 19111
- **ISO IS 19135-1:2014 (New) - Procedures for item registration**
 - Rules for managing a register of items, including submission of information
 - New version, replacing 2005 version, pending final review and adoption



Initial Concepts (1 of 2)

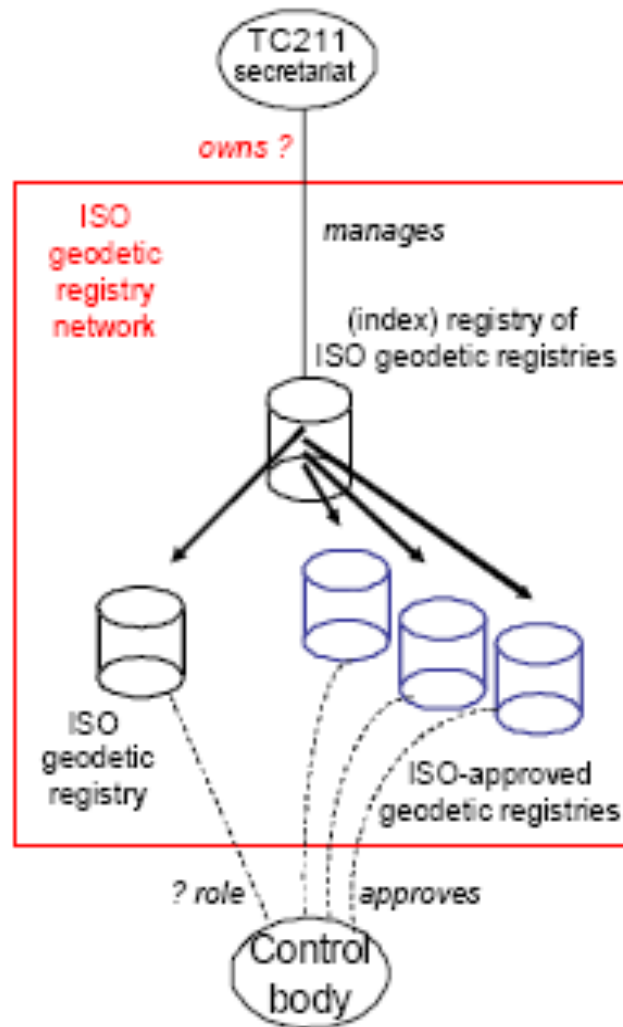


Figure 1

The proposed ISO geodetic registry network

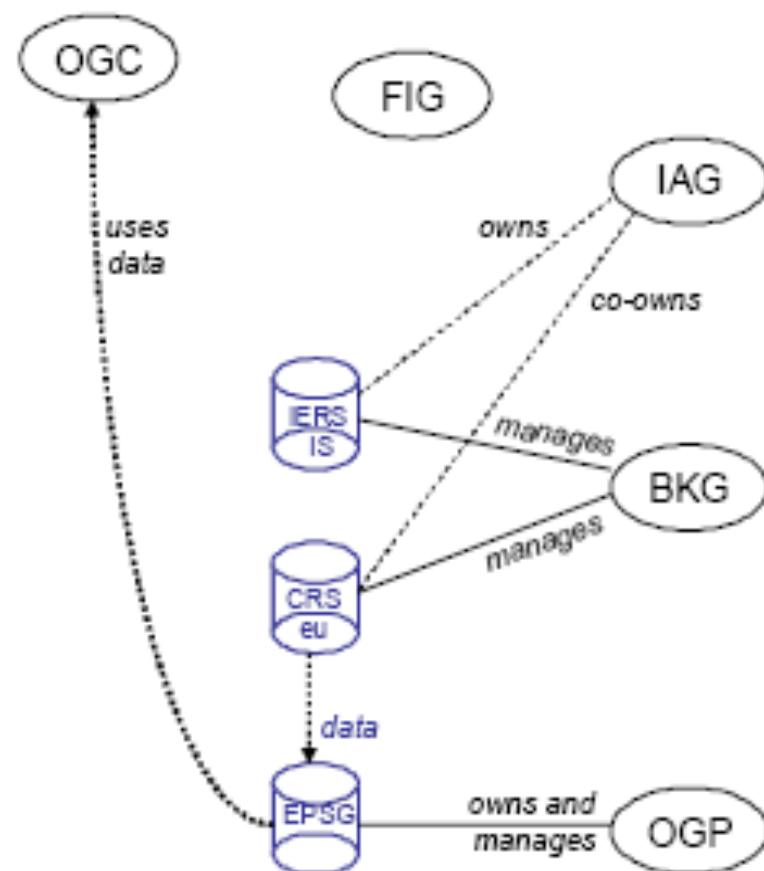


Figure 2

BKG and OGP geodetic registers

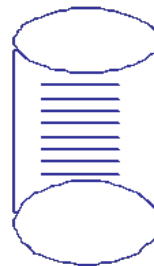
Initial Concepts (2 of 2)

ISO
geodetic
registry
network

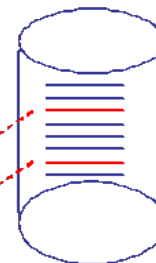


ISO (index) registry of
geodetic registers

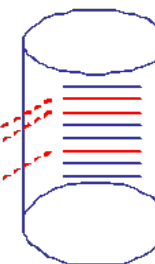
ISO-approved
external geodetic
register without
ISO data



ISO-approved
external geodetic
register including
ISO data

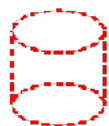


ISO-approved
external geodetic
registry including
ISO data



ISO-approved data in red

Data not ISO-approved in blue



ISO geodetic
registry
(virtual)

ISO-approved external geodetic registers

International Association of Geodesy

- Global Geodetic Observing System (GGOS)
- GGOS Bureau for Standards and Conventions
 - ISO Registry for Geodetic Codes and Parameters (RGCP)



The GGOS Bureau for Standards and Conventions

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U. Hugentobler ⁽²⁾, L. Sánchez ⁽¹⁾, P. Steigenberger ⁽²⁾

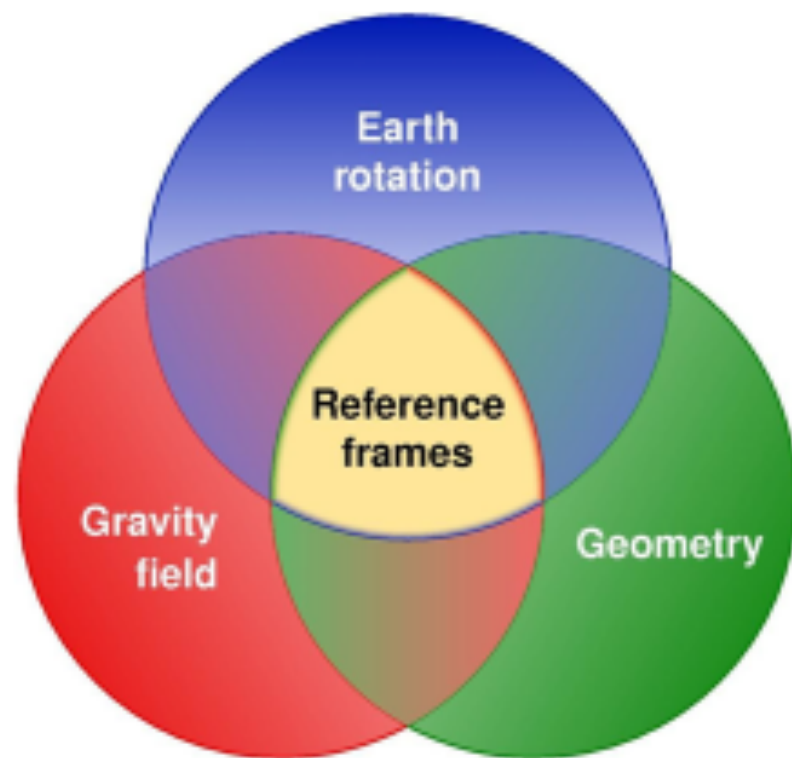
⁽¹⁾ Deutsches Geodätisches Forschungsinstitut (DGFI), München

⁽²⁾ Institut für Astronomische und Physikalische Geodäsie (IAPG), TU München

⁽³⁾ Deutsches GeoForschungsZentrum Potsdam, Germany



A key GGOS goal: Integration of the „three pillars“



(from Plag and Pearlman 2009)

What do we need ?

- Consistency among the data sets from all geodetic techniques
- Common standards and conventions (across all IAG components)
- Refined analysis and combination methods as a basis for consistent products

How to reach this goal ?

The Bureau for Standards and Conventions was established as a GGOS Component to support this major goal.

Objectives and tasks of the BSC

- The key objective of the BSC is to ensure that **common standards and conventions** are adopted and implemented by all IAG components as a fundamental basis for the generation of **consistent IAG/GGOS products**.
- Major tasks of the BSC are (according to ToR):
 - to **keep track of the observance** of adopted geodetic standards and conventions applied by the IAG Services,
 - to **review and evaluate** all actual standards and conventions,
 - to **identify gaps** and to initiate steps to close them,
 - to **propagate** geodetic standards and conventions to the wider scientific community and promote their use.

Numerical standards for geodesy

- ... are officially defined by the Geodetic Reference System 1980 (GRS80, Moritz 2000) and by the corresponding IAG resolutions.
- Best estimates of the fundamental parameters (Groten 2004)
- IERS Conventions 2010 (Petit and Luzum 2010)
- Different standards for gravity (e.g., EIGEN, GOCE, EGM2008)

Quantity	GRS80 (Moritz 2000)	Fund. param. (Groten 2004)	IERS 2010	Unit
GM_{Earth}	398.6005	398.6004418	398.6004418	$[10^{12} \text{ m}^3 \text{ s}^{-2}]$
Equatorial radius (a)	6378137	6378136.62	6378136.6	[m]
- zero-tide		6378136.72		
- mean-tide		6378136.59		
- tide-free				
Flattening factor (1/f)	298.25722	298.25642	298.25642	
- zero-tide				
- mean-tide		298.25231		
- tide-free		298.25765		
Dyn. form factor (J_2)	1082.63	1082.6359	1082.6359	$[10^{-6}]$
Ang. rot. velocity (ω)	7.292115	7.292115	7.292115	$[\text{rad s}^{-1}]$
Potential geoid (W_0)	62636860.85	62636856.4	62636856.0	$[\text{m}^2 \text{ s}^{-2}]$

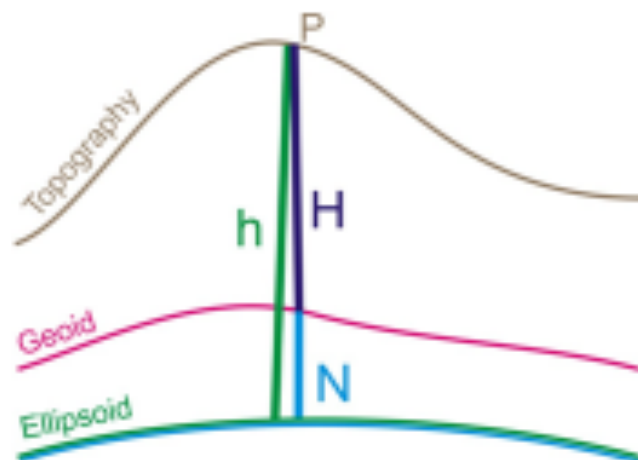
Numerical standards for geodesy

- ... are officially defined by the Geodetic Reference System 1980 (GRS80, Moritz 2000)
- Best practice
- IERS
- Different standards for gravity (e.g., EIGEN, GOCE, EGM2008)

Contradictory definitions of numerical standards !

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Heights and ellipsoid parameters

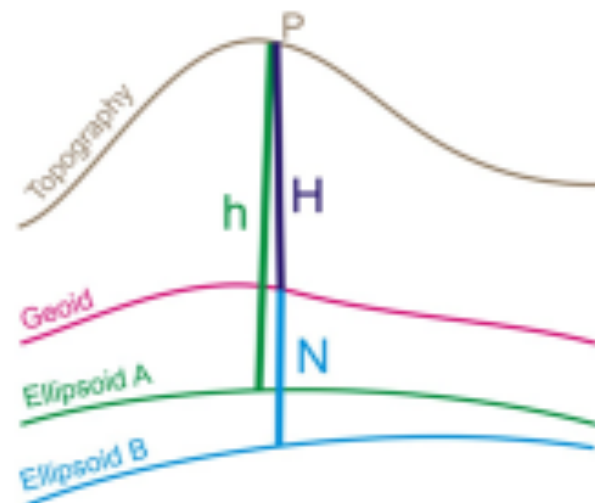


$$H = h - N ?$$

h ... ellipsoidal height
H ... physical height
N ... geoid height

Source	a	f	Reference
IERS Conventions 2010	6378136.6	298.25642	Petit and Luzum 2010
- Numerical standards			Groten 2004
- GRS80 for transformation geocentric → ellipsoidal	6378137.0	298.25722	Moritz 2000
GOCE Standards	6378137.0	298.25722	Gruber et al. 2010
GRS80 Reference Ellipsoid			Moritz 2000
EGM2008	6378136.3	298.257	Pavlis et al. 2012

Heights and ellipsoid parameters



$$H = h - N?$$

h ... ellipsoidal height
H ... physical height
N ... geoid height

This equation is NOT fulfilled, if different ellipsoid parameters are used !

Source	a	f	Reference
IERS Conventions 2010	6378136.6	298.25642	Petit and Luzum 2010
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GRS80 Reference Ellipsoid			Moritz 2000
EGM2008	6378136.3	298.257	Pavlis et al. 2012

- **Common standards and conventions are of crucial importance** for the generation of consistent IAG/GGOS products that shall be consistently applied for processing geometric and gravimetric observations.
- Some examples for the current status have been shown, indicating that there are **several inconsistencies related to standards and conventions**.
- **Users** (in particular those who are NOT specialized in geodesy) **may have difficulties to use geodetic products correctly** and to know exactly whereupon they refer to.
- The **product-based inventory compiled by the BSC identifies deficiencies** regarding standards and conventions and will give recommendations on how to resolve inconsistencies and gaps.

Recent Activities

- **ISO Geodetic Registry Implementation**
 - Open source registry management software in development
 - Lead: Prof. Dr. –Ing. René Thiele, University of Applied Sciences, Frankfurt, Germany
 - Hosted on server at Norwegian Mapping Authority, Hønefoss, Norway
 - Monthly telecons since November 2013
 - Initial data loaded for testing and demonstration
- **Control Body Membership**



Control Body Membership



P-Members

Australia (Pending)

Canada

China (Pending)

France

Finland

Germany

Italy

Japan

Republic of Korea (pending)

Saudia Arabia

South Africa

United Kingdom

United States

External Liaisons

IAG (Chair & Vice-Chair)

DGWIG

FIG

IHO

ISPRS (possible interest)

Neil Weston, NGS/NOAA (Principal) and Dan Mullaney (Alternate)

RGCP Control Body Telecon, July 25, 2014

- **Agenda**

- Review of registry implementation and status of enhancements
- Review of data model implemented in the registry
- Consider list of international reference systems with which to “seed” the registry for public release.
- Discuss pending TC211 activity to revise 19127
 - Encourage CB members to serve as experts



Matters requiring resolution

- Registry item validation and approval process
- Item codes (structured vs sequential numbering)
- Report generation (PDF, csv) of register items
- Possibility of future access to external registers in the registry
- Concerns with lack of representation of modern reference systems in ISO 19111 and 19127
 - Geoid-based vertical datums
 - Dynamic 3D reference systems
 - Treating UTM zones as separate CRS's

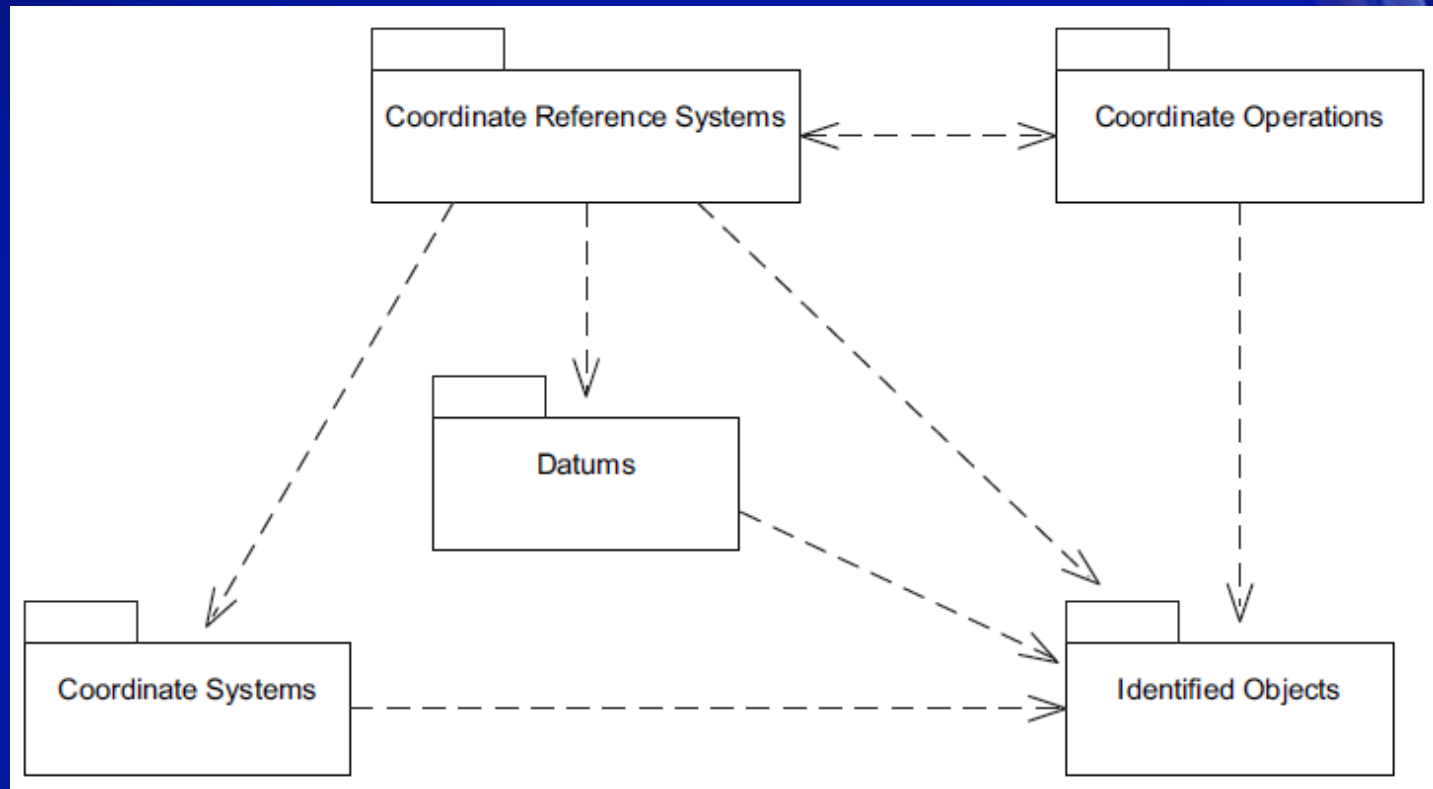


ISO Geodetic Registry Implementation

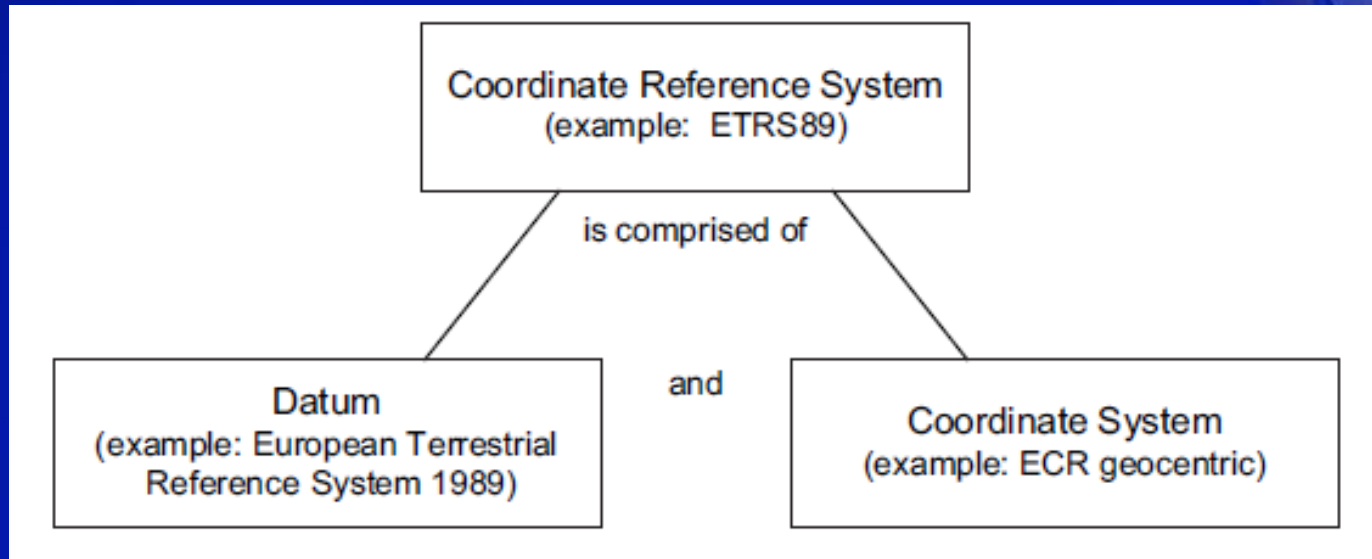
- Open Source Software for management and publication of Geodetic Codes & Parameters.
- Compliant to ISO 19135 (Model, Roles, Procedures).
- Providing item classes in conformance with ISO 19111.
- Implemented as a service interface (REST, SOAP).
- AJAX based web application (Spring Framework)



Conceptual Model



Conceptual Model



Scope

- **Management Procedures (Pending)**
 - Submission of a Proposal.
 - Approval process.
 - Withdrawal.
 - Appeal.



Scope

- Types of item proposals (Pending)
 - Addition
 - Clarification
 - Supersede
 - Retirement
 - Invalidation



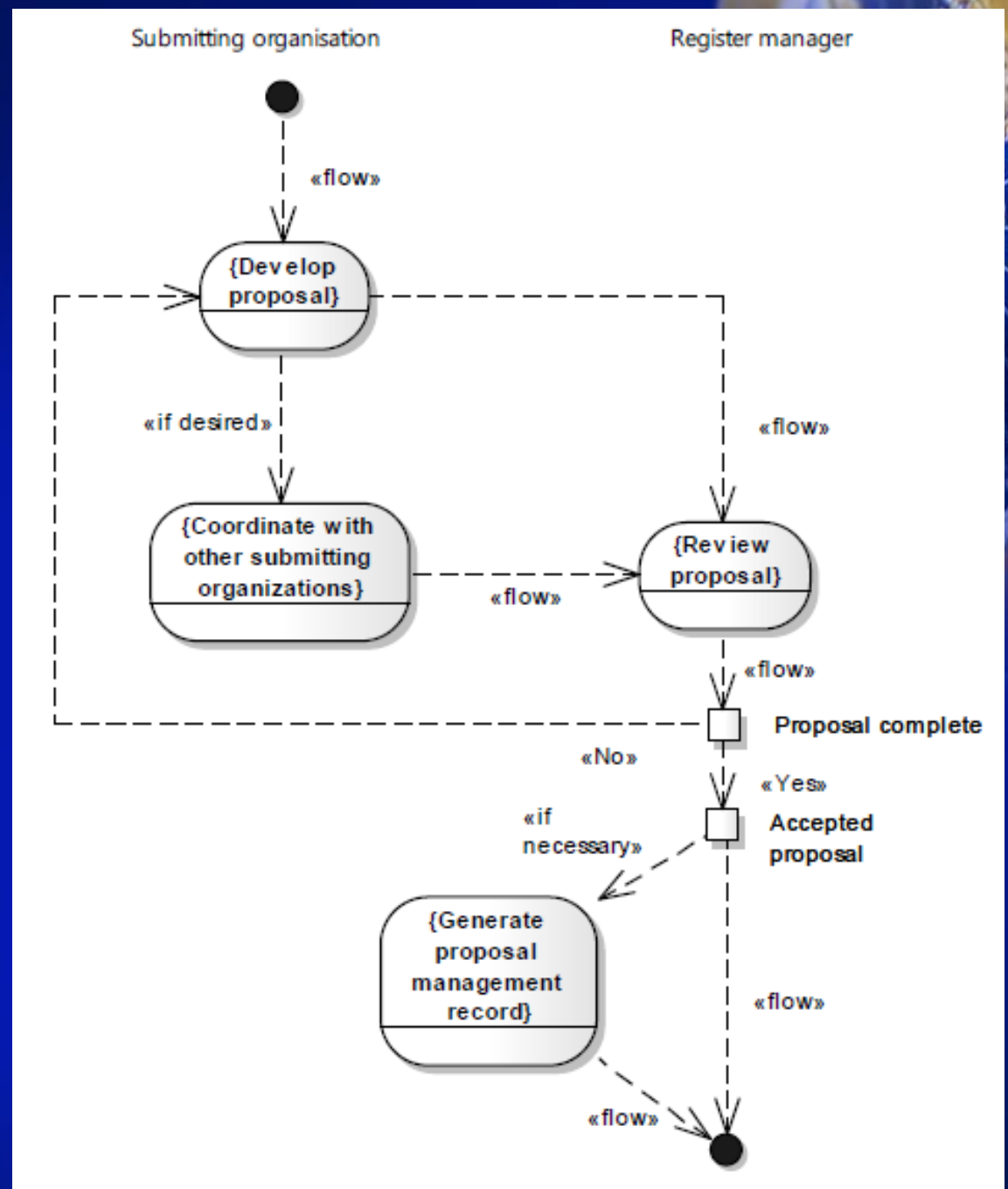
Scope

- Roles (Pending)

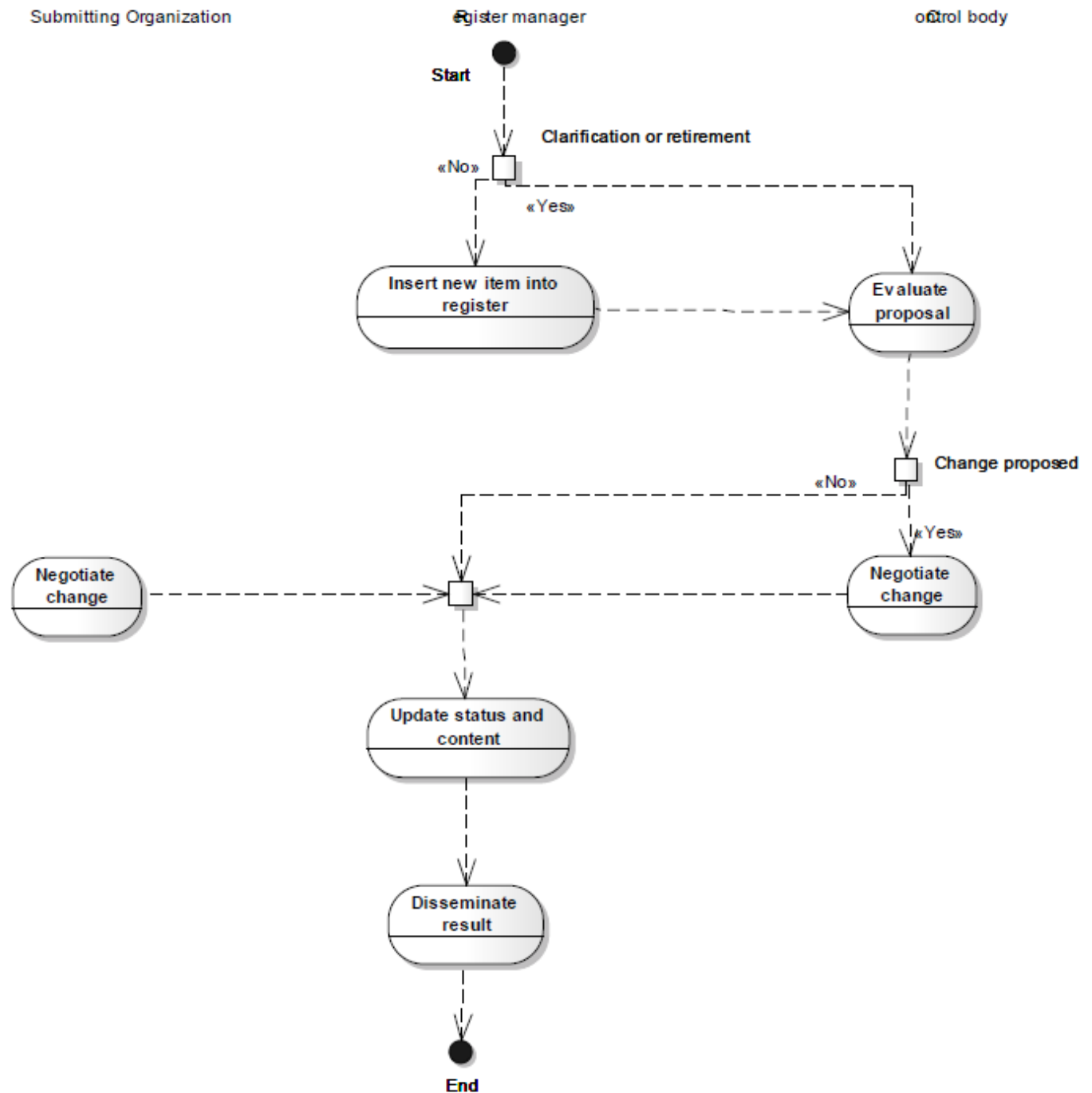
Register Owner	Organization that establishes a <i>register</i>
Register Manager	Organization to which management of a register has been delegated by the register owner
Control Body	Group of technical experts that makes decisions regarding the content of a register
Submitting Org.	Organization authorized by a register owner to propose changes to the content of a register



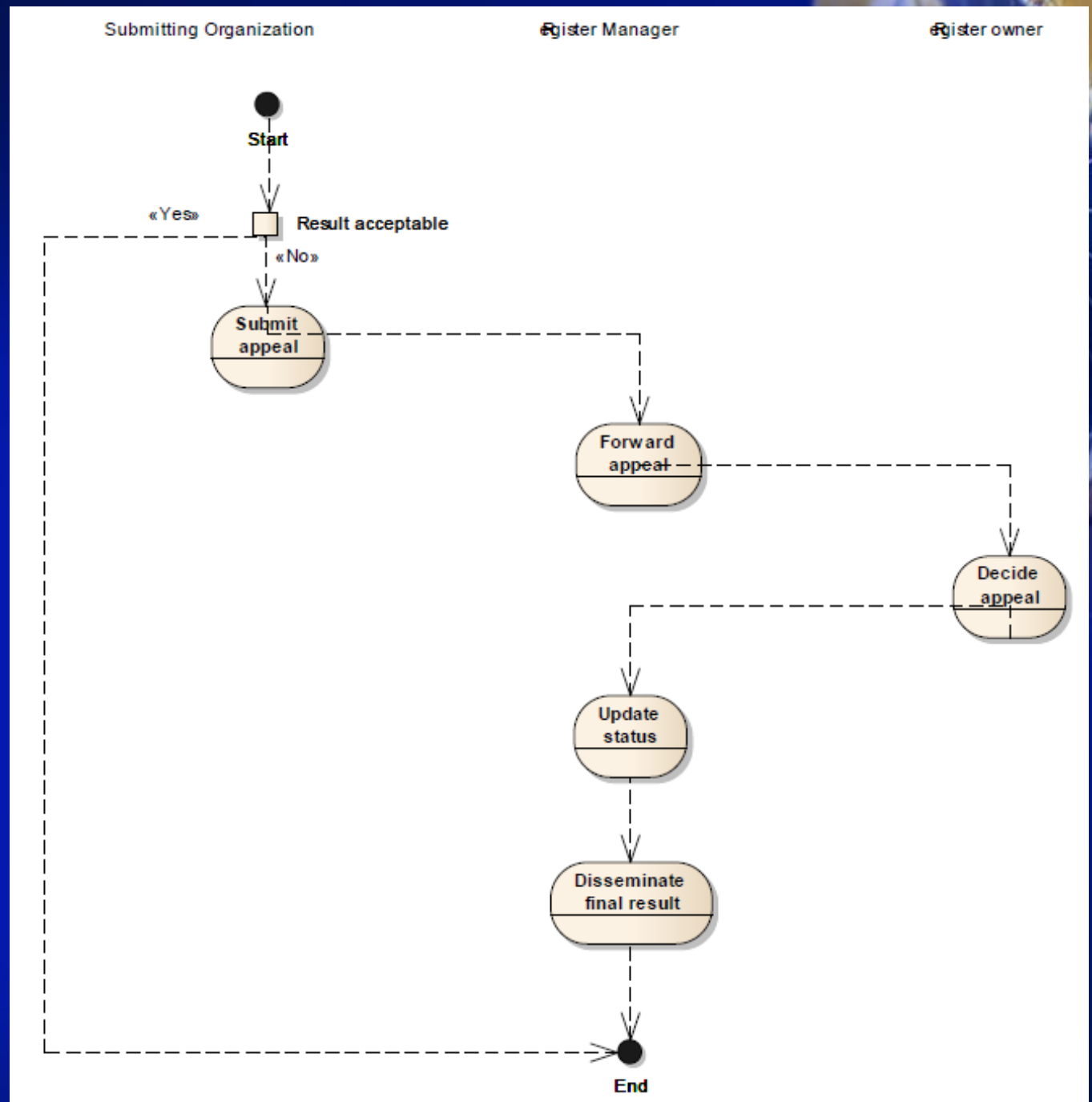
Submission



Approval



Appeal





Welcome

- [-] Register
 - [-] Geodetic Param...
 - [+] Coordinate Re...
 - [+] Coordinate Sy...
 - [+] Datums
 - [+] Coordinate Op...
 - [+] Other

*** DEMONSTRATION VERSION ONLY ***

This registry is for demonstration purposes only. The current content of the registry is provided only to demonstrate the features and capabilities of the registry software.

The registry content should NOT be used for any other purposes.

In no way should the content be considered valid data!

ISO Registry of Geodetic Codes and Parameters

The ISO Registry of Geodetic Codes and Parameters is a structured database of coordinate reference systems and transformations that is accessible through this on-line registry system. The register includes only systems and transformations of international application. It does not include all possible coordinate reference systems and transformations.

This registry is provided under the auspices of ISO Technical Committee 211 on geographic information/geomatics and conforms to ISO standards ISO 19111:2007 (Spatial referencing by coordinates), ISO/TS 19127:2005 (Geodetic codes and parameters), ISO 19135:2005 (Procedures for item registration) and its soon to be published revision ISO 19135-1 (Procedures for item registration - Part 1: Fundamentals), and ISO 19135-2:2012 (Procedures for item registration -- Part 2: XML schema implementation).

The registry may be used free of charge but its use is subject to acceptance of the Terms and Conditions of Use. Users of the registry may query and view data and generate reports via anonymous guest access. Users may also submit proposals for new additions or clarifications to the registry.

The registry also provides a web service interface, allowing geospatial software to query and retrieve information from the register. Information on using the web services is available in the registry user's guide.



- Welcome
- Register
- Geodetic Codes & P...
 - Coordinate Refer...
 - Compound CRS
 - Geodetic CRS**
 - Projected CRS
 - Vertical CRS
- Coordinate Syste...
- Datums
- Coordinate Opera...
- Other

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Geodetic Codes & Parameters

[Overview](#)[Contents](#)

Show 10 items per page

Item ID ▲	Name	Item class	Status
4171	RGF93	Geodetic CRS	valid
4230	ED50	Geodetic CRS	valid
4258	ETRS89	Geodetic CRS	valid
4267	NAD27	Geodetic CRS	valid
4269	NAD83	Geodetic CRS	valid
4275	NTF	Geodetic CRS	valid

[Report problem](#)

Future Activities

- **Membership – Control Body**
 - Seeking additional members
- **Registry Implementation**
 - Continue monthly telecons
 - Implement approval process and test
 - Continue loading registry with initial set of reference systems & transformations of **international** application
 - Planning public release Nov 2014 at 20th anniversary of TC 211

